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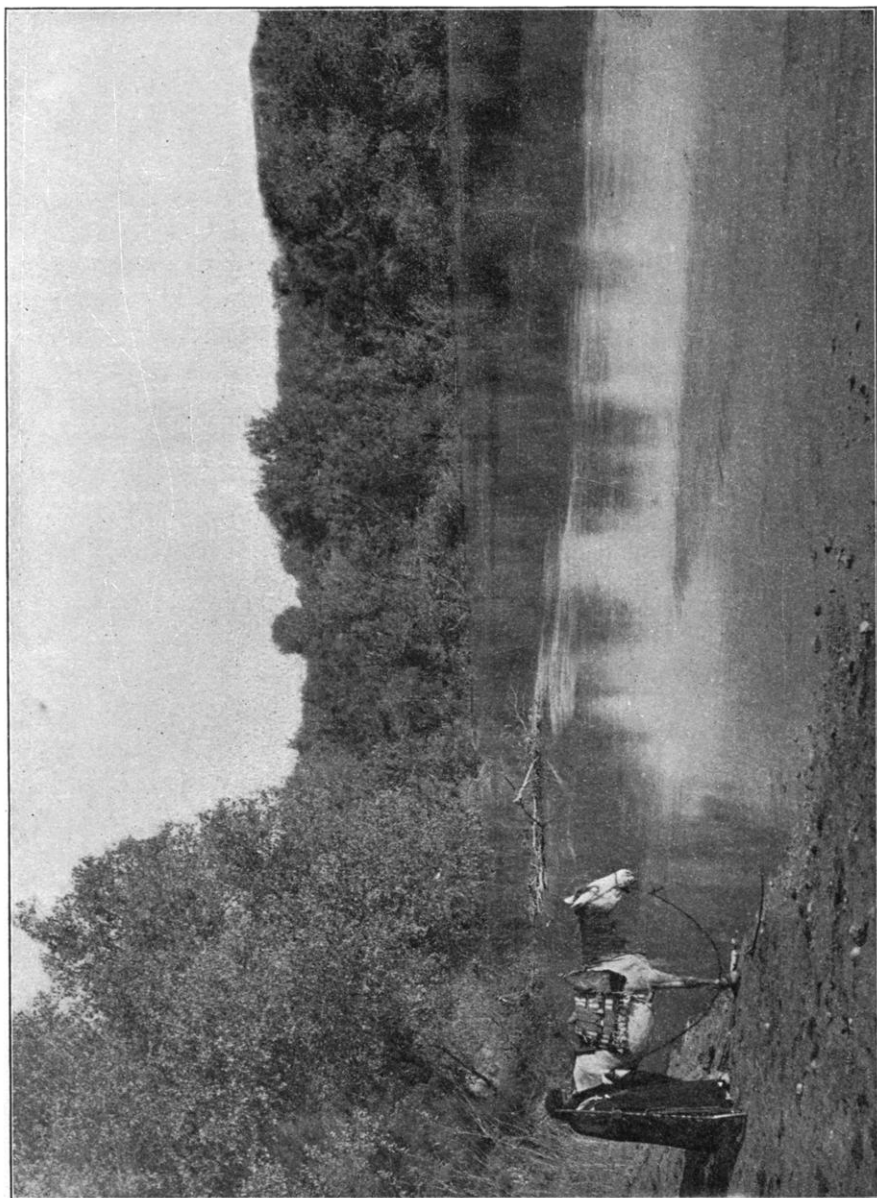
THE PHYSICAL HISTORY OF THE DEAD SEA VALLEY

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The valley of the Jordan, and especially the Dead Sea¹ at its southern end, is in physical features unique and very interesting. The Jordan rises by four sources, all more or less drawing their supplies from the snow-clad heights of Hermon. Near its southern roots we have the great fountains of Banias and El Kady; at the northwest is the longer, but smaller, tributary, the Hesbany; while still more to the west is a small stream, the Nahr Bareigheit, from Merj Aiyun. The water from these various sources all unite in the great marsh of the Huleh, and appear in one volume in Lake Huleh—the Samachonitis of Josephus. This little lake—4 miles long, 3½ miles broad, and of an average depth of eleven feet—is chiefly interesting as the home of the papyrus—the ancient source of the first writing-paper, which covers much of its waters. It is believed to support the largest mass of these reeds in the world. Where the Jordan leaves the southern end of the Huleh, it is just above the level of the Mediterranean; but in its course to the Lake of Galilee it descends through less than ten miles to 680 feet below sea-level. For the greater part of this course the river is one long series of cataracts and waterfalls.

The Lake of Galilee I am to describe in a subsequent paper. It is some 13 miles long and 6 broad, with a depth of 150 feet. The water is clear and pure, swarming with fish of some forty varieties, of which fourteen or fifteen are peculiar to this region. The cliffs around the lake are very largely of volcanic rock, and evidences of slumbering fires are shown in the abundant hot and sulphuretted springs near Tiberias and in the valley of the Yarmuk. Severe earthquakes have several times visited the region, and in 1837 a

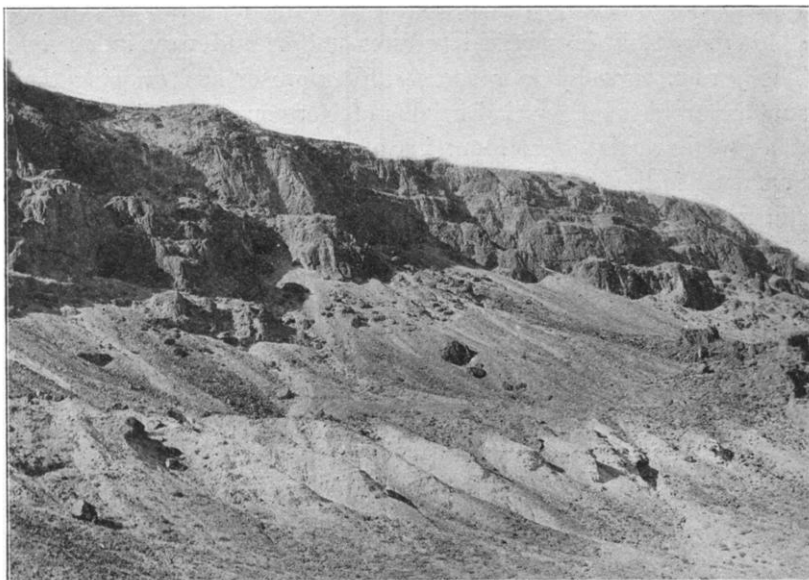
¹ In the *Biblical World* for May, 1903, was an excellent paper on "Exploration in the Dead Sea Region," by Rev. Putnam Cady. The writer of the present article has endeavored to supplement, without repeating, the information there given.



THE JORDAN

great part of Tiberias and Safed, on the hills high above the lake, was destroyed.

From the Sea of Tiberias to the Dead Sea is, in a straight line, 60 miles; but such are the extraordinary windings of the river that the length of the Jordan between these points is at least 200 miles. On this course the fall is from 680 to 1,300 feet below sea-level; the most rapid drop is in the upper part of the river's course, on which there



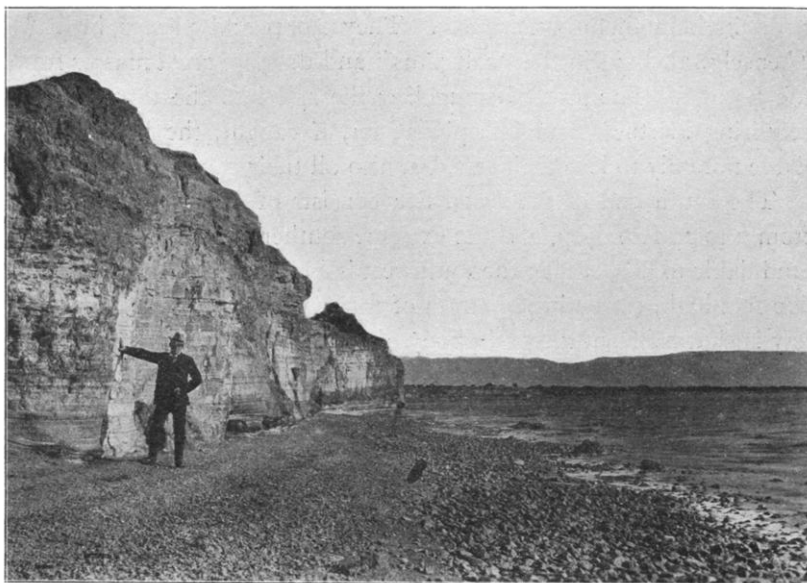
PRECIPITOUS CLIFFS ON THE WEST SHORE OF THE DEAD SEA
(Behind 'Ain Feshkhah)

are "twenty-seven tributary rapids besides a great many of lesser magnitude."² The Jordan lies in a winding bed of its own, known to the natives as the Zor, which in flood-time it practically covers, but through which in ordinary seasons it winds amid a great tangle of brushwood and trees—the "pride of Jordan" of the Old Testament. In places it washes against high perpendicular banks of marl, which it gradually undermines at their bases, so that occasionally they descend into the river and temporarily dam up its course until it forces for itself a new channel. The river, which is

² Lieutenant Lynch's *Report*, 1848.

always thus wearing away its banks, reaches the Dead Sea loaded with sediment. This it deposits along its mouth, forming a delta, but a sterile one because saturated with brine.

The Dead Sea is 47 miles long by 10 miles broad, with a depth, at a line not far from its eastern shore, of 1,300 feet. This depth, along the line of the great "fault"—the line of shifting of the earth's crust, the cause of this great rift—is exceptional, and along the west



THE VIEW ON THE NORTH SHORE OF THE DEAD SEA
(Where there are cliffs of marl and salt twenty feet high)

shore it is much less, while to the south the sea is quite shallow. The western and eastern coasts are steep, and the approaches to the beach difficult, especially in the case of the latter. Indeed, along a great part of the east coast the cliffs fall perpendicularly to the water, and even the great wadies of the Zerka Ma'an and the Mojib are too steep to traverse to or from the water's edge. At many places there are hot springs, especially in the Zerka Ma'an (the ancient Callirrhoe), where the water bursts up on all sides of the valley too hot for one to hold one's hand in it. On the whole, however, there is less sign of old volcanic activity around the Dead Sea than around the Sea of

Galilee, and the cliffs are more generally limestone, with some sandstone on the east, than volcanic rock.

The northern shore is mostly a plain, and the land slopes up gently in terraces. At one spot there are perpendicular cliffs of stratified marl 20 feet high. There are extensive lagoons on this shore, where salt is crystallized for commercial use. It is a government monopoly, and during much of the year the district is protected against smugglers; but when in the rainy season the soldiers are withdrawn, the bedouin help themselves freely. They stoop and plunge into the intensely salt fluid in the "salt pans" and drag up great masses from the bottom. The task of smuggling the salt into the towns is one requiring alertness and intrepidity, for, if caught, the bedouin are liable not only to lose their salt, but also all their camels and mules.

The south end of the Dead Sea consists of a great shallow bay from 2 to 20 feet deep, and the extreme southern shore is low marshy land liable to floods. To the southwest is a famous hill, Jebel Usdum, 600 feet high, consisting of strata of rock salt and marl. This great bay is shut off from the main body of water by a promontory 9 miles long known as El Lisan, or "the tongue." It is a great mass of stratified marl and rock salt. The comparatively narrow passage between the western end of El Lisan and the western shore was connected at one time by a causeway. Traces of a Roman road in this direction make it probable this causeway was used in Roman times, and the ruins of a crusading castle opposite where it reached the shore suggests that at that period also it was available. When the explorers Irby and Mangles³ were here in 1818, they saw a caravan crossing through the water at this spot, but for some seventy or eighty years the water has been too deep for such a purpose. In all probability there have for centuries been periods when the passage was fordable, and other periods when a rise in the level of the Dead Sea made it impassible. It has been suggested that the disappearance of this causeway was due to the severe earthquake of 1837, but more probably it is due simply to periodical changes in the depth of the sea depending upon the varying rainfall. There appear to be cycles of very wet seasons, when the rainfall over the land is much above

³ Two commanders of the Royal Navy who made an extensive tour in Palestine early in the nineteenth century.

the average, and, a greater mass of water reaching the sea (evaporation, too, being somewhat checked by extra humidity and cold), the level rises; and there are cycles when the rainfall for successive seasons is scanty and the Dead Sea level falls. At the present time we are in the middle of one of these latter periods, and the level is steadily lowering every year.⁴ The highest level reached last year was 2 feet 8 inches less than the highest in 1900. The variation in



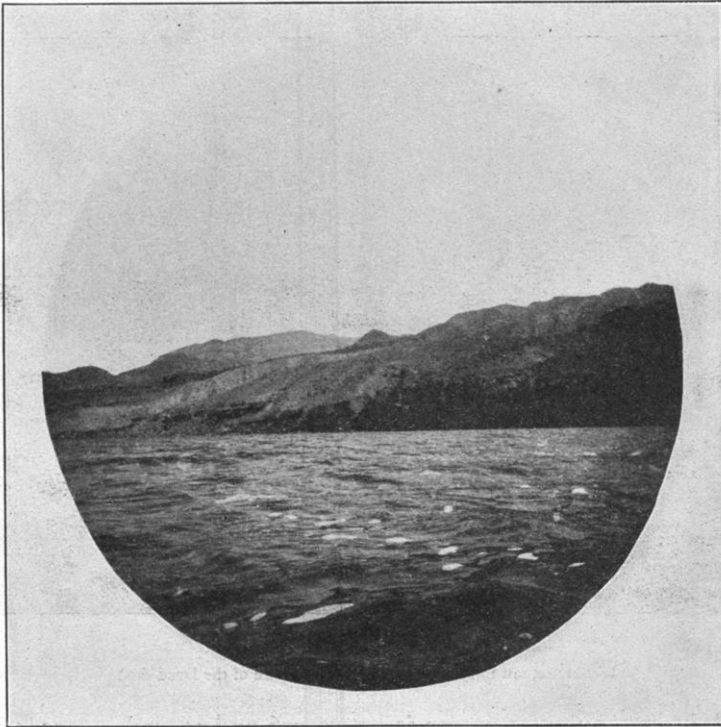
BEDOUIN SALT SMUGGLERS
(Gathering salt in the lagoon at the north shore of the Dead Sea)

level during any given season is between 6 and 26 inches, according to the meteorological conditions. There are many evidences that the level of the Dead Sea has varied backward and forward from time to time.

The denseness and consequent buoyancy of the Dead Sea water is famous. It is difficult to sink in it, though it requires some effort to keep balanced on account of the tendency for the feet to rise. Not easily stirred into angry waves, indeed usually smooth, the water

⁴ For fuller information on these and some other points mentioned here see *Palestine Exploration Fund Quarterly Statement*, April, 1902, and January, 1904.

when roused beats with great force against the side of a boat. The composition of the Dead Sea water is interesting. Besides containing, on an average, four times as much salt in solution as the ocean, it contains a certain proportion of bromine, derived, it is supposed, from the hot springs that rise under and around its waters. The surface of the Sea is somewhat greasy from the presence of a small

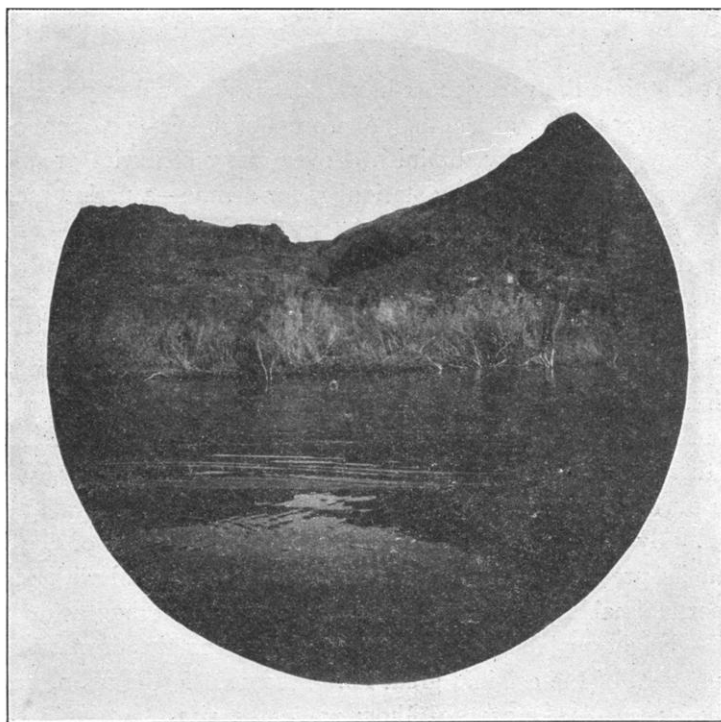


THE MOAB SHORE OF THE DEAD SEA

amount of oily or bituminous material. At times, and especially after earthquakes, large masses of bitumen float up from the bottom. In 1834 a piece was floated ashore near the southwest end which was estimated to weigh 6,000 pounds; and in 1837, after the still more severe earthquake, a piece was blown ashore large enough for seventy bedouin to stand on at once.¹

¹ It is supposed by some that it was the ignition of bituminous and oily materials that caused the great conflagration which destroyed Sodom and Gomorrah.

The wind in the Jordan valley is noticeable for its variableness. On the Sea of Galilee its uncertainty is famous, while on the Dead Sea it seems seldom to blow for many hours in any one direction. As a rule, dawn is ushered in with a gentle northeast or east breeze. Later in the day the direction is southwest. Toward sunset there is a fairly constant north or northwest breeze, which fails after midnight.



TREES GROWING IN THE DEAD SEA ON THE MOAB SHORE

The evening breeze can be more counted on than a wind from the south, and it is therefore much more easy to run down to the south end of the Dead Sea than to return. Today it is a common experience that the boat which in a few hours sails by night to the Leisan, with goods for Kerak, not infrequently requires two or three days to return, for want of a favorable wind.

At such a depth, so shut in, the heat at the Dead Sea is at all times

great, though in the winter months it is not disagreeable; but from May to October it is an impossible climate for a European.

Geologists tell us that the great rift of the Jordan valley was once an arm of the sea, practically a continuation northwards of the Red Sea; that it was cut off at a remote period by the rising of the land to the south; that, at a later period of excessive rain, the level became even higher than that of the ocean. This latter fact is witnessed to by the existence of terraces, evidently cement beaches, high above the present sea-level.

At this time the valley must have contained an unbroken sheet of water over 200 miles in length. A process of dessication then set in, and the water gradually diminished over many centuries or milleniums, sometimes remaining stationary for a time—a period marked by the formation of a well marked terrace or raised beach—and at other times drying up more rapidly. During these changes a vast amount of sediment was deposited on the lake bottom, while the soluble salts from the rocks, together with the sea salt from the original ocean, became increasingly concentrated. As the lake diminished, collections of water were left behind near the northern end of the valley, and on the site of the present Lake of Tiberias. But these, being constantly scoured by the fresh water of the Jordan, were purified, so that at last all the salt became concentrated at the south. By the time the lake here had reached a height of 600 feet, about its present level, the water was too impregnated with salt to support animal life. This is demonstrated by the fact that the deposits at that height on Jebel Usdum show no fossil remains of marine life.

The bed of the original great lake became a fertile plain, known today by the Arabs as the Ghor; while the river, cutting its way between the lakes through the soft lacustrine deposits, has made for itself a deeper channel, the Zor.

The changes I have briefly described all occurred long before the dawn of history, before man lived on the earth. But what a drama has man played upon this stage! The tragedy of Sodom and Gomorrah in the dim beginnings of history, and the whole history of Jericho from its tottering walls in Joshua's day and the veiled tragedy of Hiel the Bethelite, down to the horrors of the last hours of the "Great" Herod! At the Sea of Galilee we have the fate, worse—we are told—

than that of Sodom and Gomorrah, which overtook the highly favored Capernaum, Bethsaida, and Chorazin.⁵ Here, also, and still more at the fortresses of Machærus and Masada,⁶ was witnessed the bloody ending of the last national hopes of Judaism. A few centuries farther down, eastern Christianity, as a political power, was for its corruption utterly overthrown by the hordes of Mohammed's followers at Pella.⁷ While another and more militant, but equally corrupt, power, aggressively flaunting a cross the essential teaching of which it despised, within sight of the Lake of Tiberias and on the slopes⁸ toward its valley was crushed as signally. These events make a chapter of tragedy, though indeed a just verdict from history on sin and falsehood, such as nowhere in this earth is focused in so small an area. The horror of it all seems for many minds to have become projected on the landscape, and certainly until recent years people have viewed this great rift in the earth's surface, especially its southern end, as a place of ill omen. Looking at the scene with eyes prejudiced by all that has happened, they have seen threatening and danger when none existed, and have transformed a fair corner of God's earth into a brooding terror. During the first half of the nineteenth century there seems to have been much of this in the minds of the explorers who ventured to this region, and, sad to say, their fears were only too abundantly realized. Of these explorers I will speak in my next paper.

⁵ Matt. 11:21-24; Luke 10:13-15.

⁶ Josephus, *Wars*, VII, 6, 8, 9.

⁷ The battle of the Yarmuk or Pella, 636 A. D.

⁸ The battle of Hattin, 1187 A. D., when the Crusaders were almost annihilated.